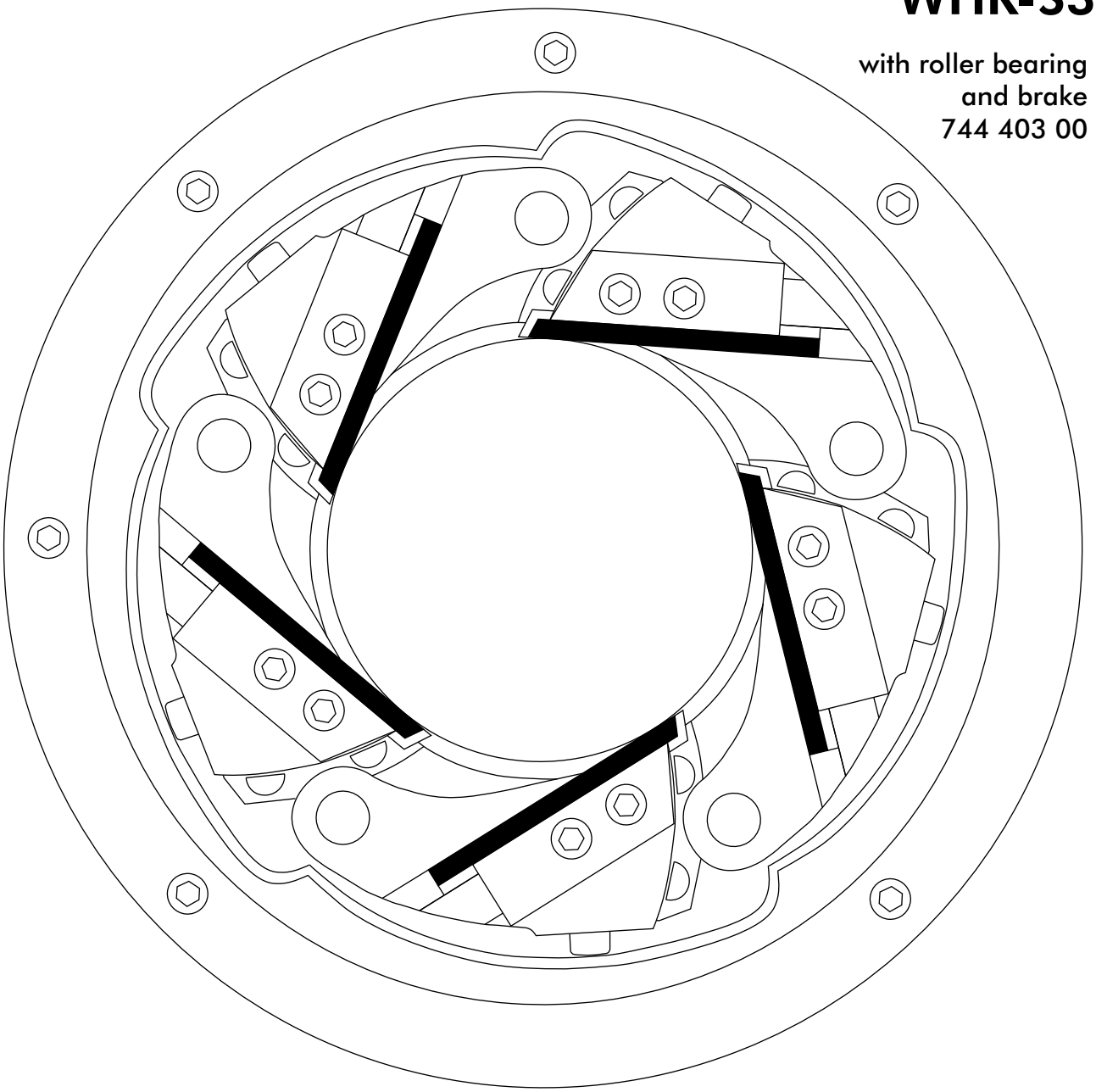
Operating Instructions

Thread Cutting Head
Type: **WHK-S3**

with roller bearing
and brake
744 403 00



WAGNER®
WERKZEUGSYSTEME
MÜLLER GMBH

Table of contents

1.0 Principle of die head operation

The die head operates with four tangential chasers. In order to have a large working range and to adapt the chasers to the screw pitch as closely as possible there are various Sets of chaser holders which are interchangeable.

Via cylindrical holder sliding pieces in the form steps, the cutting pressure is transmitted to the eccentric ring. As soon as the thread length is reached the latter slides from the step so that the die head is opened and reverse traverse may take place without any difficulties.
These is to wind that a security trip is provided (see drawing GSK 22 for WEK-S8 respectively drawing GSK 19 for WHK-S3), at the working spindle, an which the chaser die head is mounted.
This security trip avoids a complete re-sliding of the die stock ring and is only to be removed for changing of the holders.

This die head has been used successfully in hard working conditions.

2.0 Application of die head

The die head is supplied in special execution for automatic pipe cutting machines. Due to the Operation method the die head with the working spindle has to be axially moved to be machined. As the movement of the die head is axial the operations: closing, thread-cutting and opening are effected by stops. These adjustable stops mounted on stationary guide bars control the die head through the closing ring located by roller bearing rings. The head is equipped with a brake and two pawl-devices to avoid an undesired opening of the head.

It is necessary that the machine is having an electrical locking which avoids a return of the spindle sleeve, if not the front position of the spindle sleeve have been reached before. This security-locking must also be active while setting-up reaching the end-position then the unlocking of the locking catch will be left undone. By means of this a damaging of the chaser die head may occur.

For the application an control of the chaser die head you should take in band our dimension drawing GSK 22 for WEK-S8 respectively GSK 19 for WHK-S3. First you have to clamp the adjustable trips, the chaser die head must have this position, where he is opening immediately afterwards (the collar ball bearing touches the trips), e.g. cutting procedure is finished, the chasers have only to be swung out of the component. Then both locking devices will be clamped an the guide bars under consideration of the dimension 50 m for WEK-S8 respectively 53 mm for WHK-S3. For opening the locking devices earlier than the chaser die head it is necessary to displace the roller accordingly.

All external Pipe Threads stated in holder table on page H1 can be cut.

A. Cutting of taper pipe threads

Cutting of taper pipe threads is effected in a continuous way. According to the taper of the thread a taper cam ring, chaser holders with taper sliding and taper chasers are required.

B. Cutting of parallel pipe threads

Cutting of parallel pipe threads is effected by a cylindrical cam ring and chasers for cylindrical threads.

3.0 Handling of die head

A. Co-operation of the head components

The die head consists of four basic components:

1. Die-stock
Die-stock (16) is fastened with four studs (23) and nuts (24) to the headstock spindle of the Thread Cutting-Machine, with the nuts being accessible behind the spindle flange. On its face side it bears the hardened die-stock plate with internal hexagon screws (28). This takes the holder bolts (27) on which are mounted the chaser holders. The holders are guided in holder guides (29), which should not be screwed off without reason. Pressure bushes (17), by means of springs (18), press the holders to the exterior. Their movement is limited by bolts (19). The feather key (20) fitted an the die-stock serves for preventing the die-stock ring from distortion and receives the contact pressure of the brake.

2. Die-stock ring
The eccentric casing (4) with eccentric ring (1) inserted is connected to guide ring (10) by means of the four internal hexagon screw (9). This unit is called die-stock ring. The guide ring being guided along the feather key (20), the die-stock ring can only be shifted axially an the die-stock. In the eccentric casing the eccentric ring is clamped with clamping screw (7) and tension nut (8). When this clamping is released, the eccentric ring may be displaced towards the die-stock ring by turning adjusting pinien (5) by which is obtained a change in diameter.

3. Holders
Holders (60) taking the chasers are mounted an holder bolts (27) and are locked axially by the holder guides fastened to the die-stock plate. For receiving pressure they bear an the eccentric ring together with the slinding pieces (62). If the die-stock ring was pushed back far enough, they are swung out of the holders guides and removed from the head without loosening the holder guides.

4. Roller bearing ring
The exterior ring (42) is for axial movement of base ring.

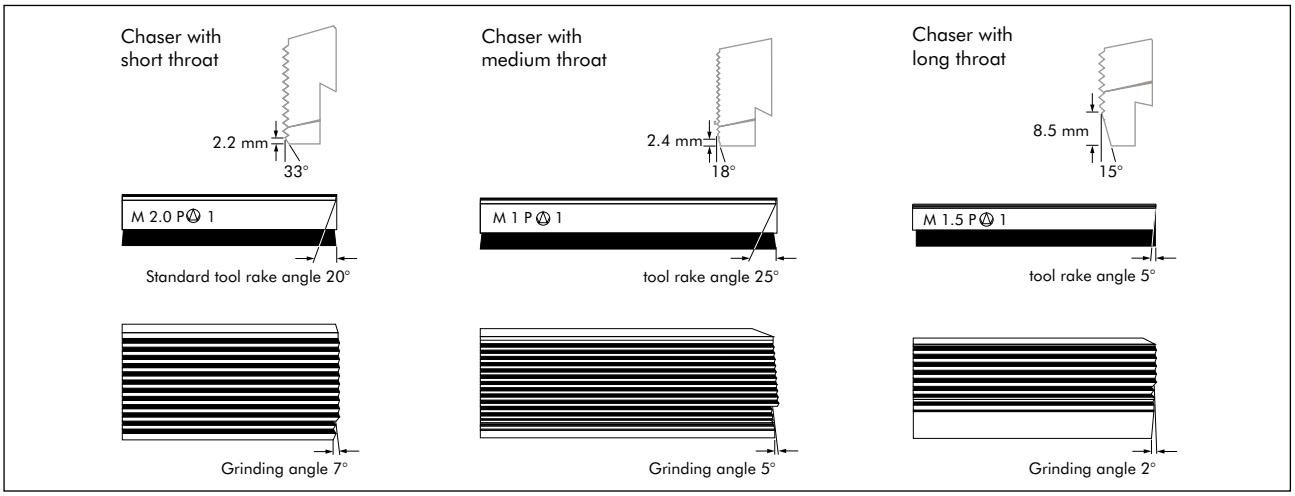
5. Chaser holders
The chasers have a parallel thread profile, i.e. threads, which have not the same diameter but the same pitch can be cut with a set of chasers; e.g. M 6 and M 12 x 1, where, of course, according to the different helix angles and diameters two different holder types have to be used.

Throat long — For work pieces in milled material or with oversize, run-out of thread approx. 4 x pitch

Throat medium — For work pieces without oversize, blank or pre-worked parts, run-out of thread approx. 3 x pitch

Throat short — For work pieces with threads against shoulder, run-out of thread approx. 2 x pitch

In exceptional cases for materials with larger oversize, a throat can be supplied with two throat bevels. The longer the throat, the better the thread-surface and the longer the chaser-life.
When choosing the throat, however, it must be absolutely considered, that the chasers with their side faces do not contact the work piece.



B. Inscription of the chasers and the head

The thread form, the pitch and the number of the chasers within the set are engraved. If on the position * a production-number is engraved only chasers with the same number in one set have to be used.
Examples for the Designation of the Thread at the Chaser :

M 2,0 P
Chasers for all metric threads as per valid DIN 13 with a pitch of 2,0 mm

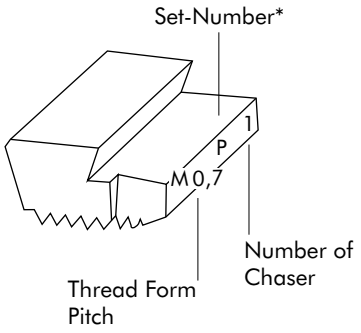
W 11 GG
Chasers for all Whitworth-threads as per DIN 11 and for all cylindrical Whitworth-pipe-threads as per DIN 259 with a pitch of 11 threads per Inch

R 11 GG K 1:16 A OV
Chasers for conical Whitworth-pipe-threads with cone 1:16 as per DIN 2999 and 3858 with a pitch of 11 threads per Inch for conical thread cutting on chaser width i.e. without device.

R 11 GG K 1:16 A
Chasers for conical Whitworth-pipe-threads with cone 1:16 as per DIN 2999 and 3858 with a pitch of 11 threads per Inch for continuously conical thread cutting i.e. with device.
TR 10 - 14 x 3 Chasers for trapezoidal threads as per DIN 103 ISO with a diameter of 10 to 14 mm and a pitch of 3 mm

The holders can only be used in sets and cannot be exchanged against those of other sets. The production number is marked with "A" e.g. A 6 (letters and numbers between 1 and 100).
Underneath is the holder type ("B") e.g. WE 21 B or WH 21 B.
The holders of a set are marked with the numbers 1 to 4 and "C" fig. 2. As all holders are adapted to the guides besides each bolt, on place "D", is the number 1 to 4. The range of holders can be looked up in the holder table. Despite this, on the front of holder 1 in place "E", under the holder type, the range of the minor diameter, i.e. 8 28, is specified. In addition, the holder angle is marked.

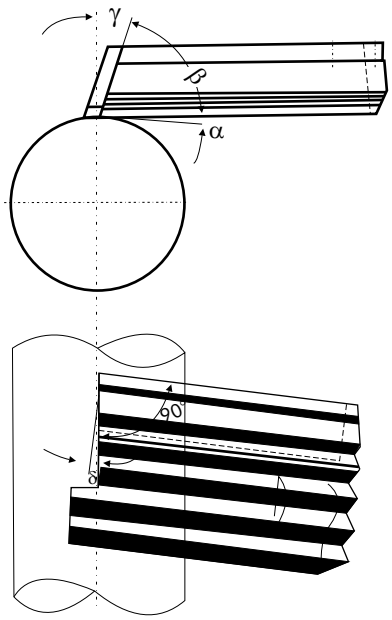
Fig. 2 Inscription of the Chasers



* If here a production-number is engraved only chasers with the same number in one set have to be used.

Fig. 3 Chaser Angles

α = Clearance Angle γ = Rake Angle
β = Lip Angle δ = Cutting Angle



C. Changing the holders

To change the holders, first you have to remove the security trip (see GSK 22 for WEK-S8 respectively GSK 19 for WHK-S3), then it is necessary to turn the cam ring so that the sliding key under the eccentric cam freely move. The base ring has to be moved backward so that the chaser holders can be swivelled and taken off without loosening the holder guides (29). Before mounting them again, it is necessary to clean and oil the sliding surfaces. It is to observe that the pressure bushings (17) work perfectly.

The chaser holders are marked 1 to 4 on the front of place "C". The holders are to be used according to marking "D". To close the head use clamping ring (51) which presses the sliding pieces (62) and the head can be closed.

D. Changing the chasers

1. Removal of chaser from holder

For removing chaser (70) from holder (60) loosen the two fixing screws (61), then it is possible to remove the chaser by pushing it towards the cutting end. It will be useful to place the chaser immediately into the adjusting attachment which is clamped in any vice or in the vice of the machine.

2. Setting the dial gauge

Replace stop pin by the relative setting gauge. Then adjust the dial gauge in the following way: Insert it into dial gauge holder and shift it axially until the small pointer of the dial gauge is precisely pointing at zero. Now tighten clamping screw but take care that the movement of the feeler will not be hindered. Then turn the dial of the gauge until the big pointer "g" will likewise precisely point at zero. Having inserted again stop pin in place of the setting gauge, the adjusting attachment is ready for setting the chasers.

3. Setting the chaser in the holder

Put the carefully cleaned holder (60) on guiding pin. Clamping plate (63), fixing screws (64), and adjusting screw (65) with stop (66) are already loosely in the holder. Now slid chaser (70) into the holder and clamp it slightly with fixing screws (64).
Take care that the chaser number corresponds to holder number.

Now swing the complete holder up to stop pin by which is retracted the feeler. For vertical adjustment set dial gauge with the small hand-wheel so that the feeler will touch the tip of the last cutting tooth. As a matter of fact, the feeler must never touch the guide teeth. Now you may advance the chaser by means of adjusting screw (65) until the dial gauge reading will correspond with the setting value given by the relative setting chart (as regards the theoretical setting value, setting beyond or below centre, see fig.8.

Care should be taken that both of the small pointer for the millimetre graduation, and the big pointer for the one hundredth reading, are in accordance with the setting value. If for example the chaser shall be set to the 1.75 setting value, the small pointer should be between 1 and 2 and the big pointer should point at 75.

Next to this the fixing screws (64) may be locked tightly but first tighten the frontal fixing screw in order to avoid tipping. Moreover, it is advisable to retighten afterwards adjusting screw (65). If the chaser should be used up to such a degree that clamping plate (63) is inclined to tilt during the tightening of fixing screws (64) then it will be indispensable to add shim (71/72). This shim is profiled like the chaser dove-tail and can be supplied in various lengths. A chaser set in this way is now ready for cutting and the holder may be taken from the setting attachment.

E. Grinding the chasers

The chasers being the real cutting tool of the whole thread cutting head system are supplied with a corresponding throat as already described in section a) and b). This throat will not be modified and will exist during the whole chaser-life.
The chaser is reground on its front, which is also the true rake. This regrinding differs only little from the regrinding of conventional tools known. There are only some points to be considered in particular, which especially are determined for tangential chasers.

1. Possibilities of grinding

The regrinding of the chasers can be made on every universal tool machine. As a help WAGNER® supplies a grinding fixture, which permits the clamping of the chasers as well as the
setting of the necessary angles. If no tool grinding machine is available we recommend to use a WAGNER® -chaser grinding machine.
As grinding wheels cone-shaped cup grinding wheels EKW 60 Jot, with strengthened edges suit best. These wheels can be supplied by WAGNER®.

2. Selection of the rake angle

The rake angle depends as in case of all cutting operations on the material to be cut, on the possibilities of lubricant and of coolant and on the cutting speed.

Standard Time Data

Material	Rake Angle°
Free cutting steels	16 - 25
Structural steels up to 500 N/mm²	16 - 25
Structural steels > 500 N/mm²	16 - 25
High-alloyed steels (stainless)	22 - 30
Tubes	20 - 25
Malleable iron-fittings	15 - 22
Gray cast	10 - 20
MS 58	- 4 - 10
MS 60-62	8 - 20
Bronze	8 - 20
Copper	20 - 30
Aluminium-alloys	18 - 30

In special cases e.g. when working with steels with a low resistance St 37 and similar steels, stainless materials, copper and aluminium, it may be better not to grind the true rake on a plain face but to provide it with a radius (so-called flute), which essentially favours the outlet of the chips in case of these materials.

3. Layout of the grinding angle

The grinding angle is in a certain angle to the thread profile and compensates the holder angle, the throat bevel as well as the rake angle in such a way, that the cutting edge again runs in a parallel relation to the axis of the work piece and thus an accurate thread profile can be cut. Accordingly, the grinding angle consists of holder angle and a supplementary angle. For the most usual rake angles of 20° and 25° the supplementary angle for angular threads can be taken from the following table for normal throats.

	Grinding Angle	
Throat	20°	25°
long	3.0°	3.8°
medium	3.5°	4.5°
short	5.0°	6.5°

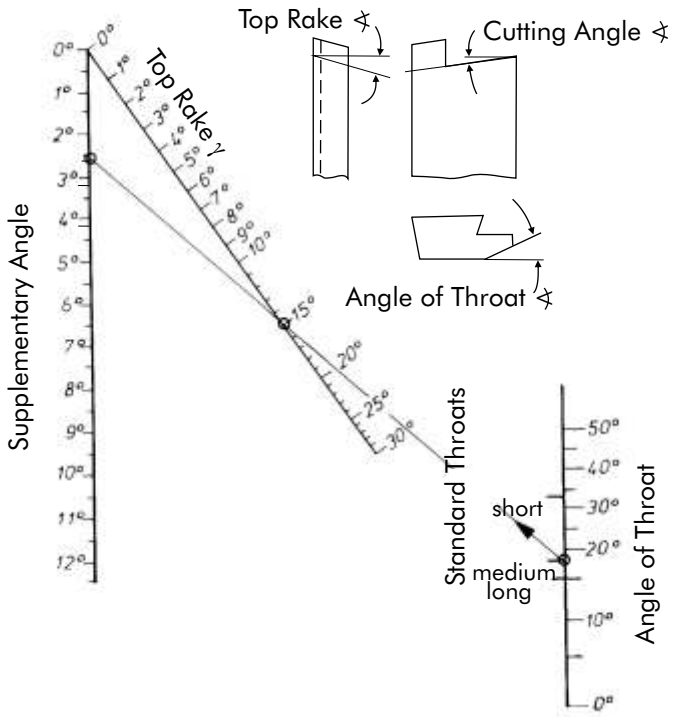
**Grinding Angle =
Holder Angle + Supplementary Angle**

In order to determine the supplementary angle for other rake angle values and special throats the nomogram in fig. 4 can be used as follows:
To look for the throat or for the corresponding throat angle on the right scale, make a straight line from this point across the corresponding rake angle on the medium scale to the left scale. There, the supplementary angle can be read.
In special cases, when cylindrical threads without guide teeth are cut, the supplementary angle is not necessary. Then it follows:

Grinding Angle = Holder Angle

When cutting conical threads on the width of the chaser, which is effected without guide teeth also a supplementary angle has to be used, which compensates the conical form of the chaser, so that the whole cutting edge is again parallel to the axis of the work piece. This supplementary angle amounts to 1° in case of a thread with cone 1 : 16, 1°.
When cutting conical threads with continuously opening thread cutting heads (type Z-K, Z-GK and GEWE), generally chasers with guide teeth are used. In special cases e.g. high cutting speeds and in case of a formation of built-up edges chasers without guide teeth can bring an improvement.

Fig. 4 Nomogram for Determination of Supplementary Angle



Example

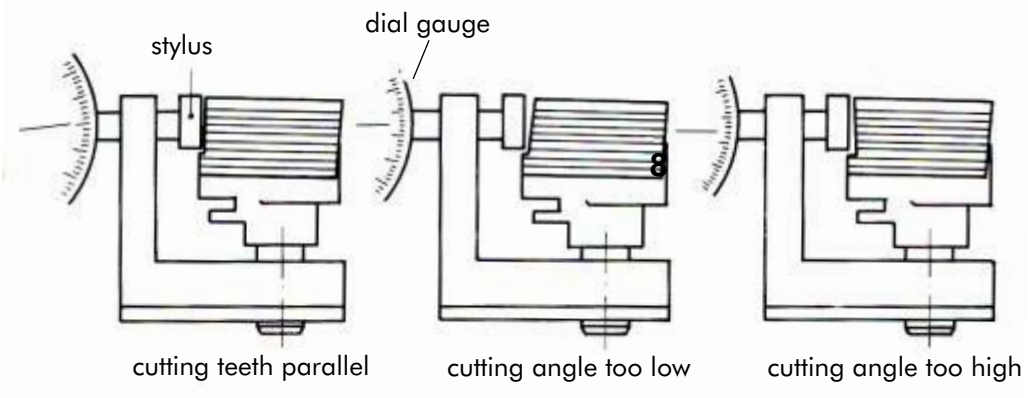
Angle of Throat:	18° (medium)
Top Rake:	15°
Results to Supplementary Angle:	2.6°

4. Checking the grinding angle with the setting device

The grinding angle can always be controlled in the setting device. The cutting edge of the chaser should be parallel to the measuring pin of the dial gauge, and the measuring pin is parallel to the axis of the work piece.

In practice it has been shown, that for most materials this parallel position of the cutting edge of the chaser to the axis of the work piece gives the best results. In some cases for instance for stainless materials it may be necessary to reduce the grinding angle, sometimes even to the negative domain, whereas an increase is not recommended.

Fig. 5 Checking the Grinding Angle with the Setting Device



5. Grinding of the chasers

After selecting the necessary angles, according to page 7 and page 8 the chasers can be ground. In case of dry grinding you have to pay attention to a moderate temperature of the chasers. On no account the chasers must be immersed in water later. When grinding wet a sufficient amount of coolant has to be used. Mistakes may lead to appearance of hairline cracks and to breaking out of the chaser cutting edges.

Grinding without guide tooth:
In fig. 6 and 7 on the left "f" is absent, i.e. the chasers are ground straight on their face with the adjusted angles.

Grinding with guide tooth:
See fig. 6 and 7, right.
Here the grinding consists of two phases of operation

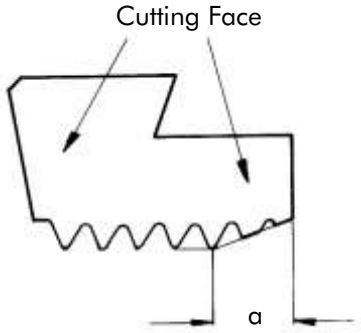
Grinding of the Guide Foot (= Guide Teeth)
It is recommendable, that the guide tooth juts out as less as possible (5 to 10 % of the thread-Ø) against the cutting teeth. As grinding angle the holder angle is adjusted and as rake angle a value between 0° and the selected rake angle is adjusted. This in not too important, as the guide teeth do not cut but lay beyond the centre of the work piece and do only guide.

Grinding of the Cutting Teeth:
The angles selected respect-tively determined of page 7 and page 8 are now adjusted exactly. The cutting teeth are ground in a sharp-edged way between the first and the second complete cutting tooth. The sharp-edged execution of the corner is most important, as if the flank of the first tooth is ground chips can gather and this will lead to a breaking out of this tooth and also to a production of unclean threads.

Jutting out of the guide tooth:
Guide teeth that are too long can also result in gathering of chips and as the guide teeth are laying too far beyond the centre line of the work piece small thread diameters cannot be adjusted. Too short guide teeth do not guide enough. If you work with a lead screw feed, it is not absolutely necessary to use guide teeth.

Fig. 6 Cutting Faces on the Chaser

Grinding **without** Guide Tooth



Grinding **with** Guide Tooth

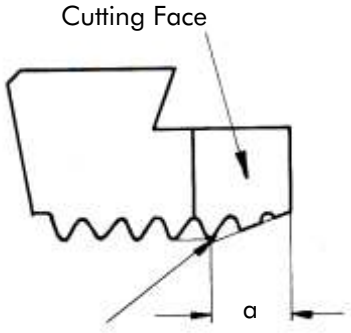
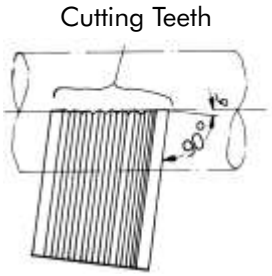
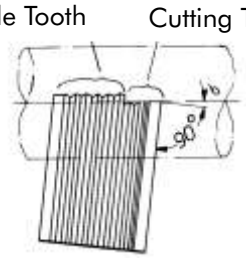


Fig. 7 Chaser Forms for Thread Cutting

without Guide Tooth



with Guide Tooth



F. Setting the chasers

To ensure that the chasers are uniformely set in the correct relationship to the work piece, they are adjusted in a setting device by means of a dial indicator. This setting is comparable to the setting of the lathe tool on the center height. The corresponding values can be obtained from the setting table.

Determination of the setting value

The setting value results from the setting length which is the gauge from the centre of the holder to the point of contact at the core diameter of the thread.

The setting value so depends on the core diameter of the thread and varies according to the diameter.
To ease the setting process these setting lengths were converted into setting values, which can be obtained from the holder tables. By using the adjusting device the values are transmitted onto the chasers.

In order to determine the setting value of the thread you wish to cut you have to look for it in the holder table. There you will find on the right hand-side a column called »setting values« where the setting value using the appropriate gauge is listed.

The listed setting values are always positive values according to the adjusting gauge diameter stated on top of the setting value column.

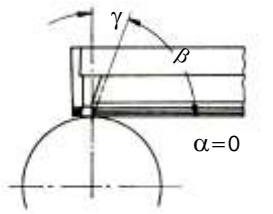
A setting according these table values means that the cutting edge of the threads cuts exactly on the centreline of the work piece.

In practice, it has been shown that the value has to be suited to the different materials. The following data may serve merely as guidelines, because other factors like for instance centreline accuracy between cutting head and work piece, clearance of slide and shaft,… have a bearing on the setting value.

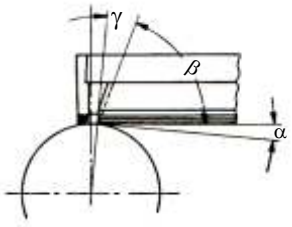
The setting value has to be increased by the determined value from the following table.

Fig. 8 Setting of the Chasers

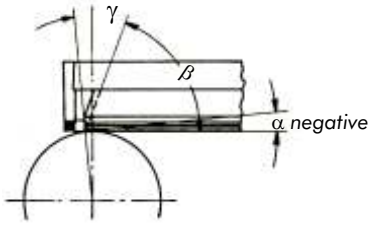
α = Clearance Angle γ = Rake Angle
β = Lip Angle δ = Cutting Angle



Cutting Edge Centered

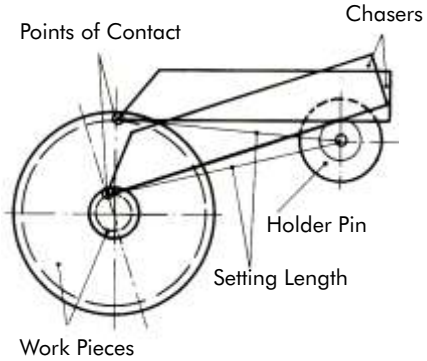


Cutting Edge Below Center



Cutting Edge Above Center

Fig 9 Setting Value and Setting Length on the Chaser



Material or form of the work piece	Addition in % of the diameter of the work piece
Free cutting steels	1 - 2
Structural steels up to 500 N/mm²	1
Structural steels more than 500 N/mm²	0.5 - 1
High-alloyed steels (stainless)	0 - 0.5
Tubes, cylindric threads	0.5 - 2
Tubes, conical threads	1- 2
Gray and malleable cast	1- 2
MS 58	2
MS 63, Bronze	0.5 - 2
Copper	0.5 - 1
Aluminium-alloys	0.5 - 1

Example

Thread M 10 x 1	
Material 9 S 20 K	
Setting value from holder table	0.60
+ 1.5 % von Ø 10	0.15
Setting of the Chasers	+ 0.75

The chasers must not be increased more than absolutely necessary, that means until chatter marks are no more visible on the thread.
An over-increase of the threads leads to a greater friction between tool and work piece which causes an increase of temperature and bigger abrasion.

4.0 Thread cutting

A. Setting of the thread diameter

The diameter of the thread to be cut is set by turning of the eccentric ring (1). Setting is continuous.
Setting is effected with die head closed according to a thread sample or a bolt corresponding to the core diameter.
To adjust the diameter it is necessary to loosen clamping screws (7) being situated on the front side by means of the square socket wrench (52).
Then the adjusting pinion (5) is turned until it will no longer be possible to turn the thread sample manually. Afterwards the clamping screws (7) are retightened. A possible readjustment would be necessary alter having checked the first thread being cut.

Scale "f" only serves for finding a once made-out position of the eccentric ring again.

B. Selecting the cutting speed

1. Choice of cutting speed

From turning the reader is used to obtain precise Information on the cutting speed with respect to using various materials and tools. In thread cutting such an Information is not possible because the cutting speed depends on too large a number of factors, e.g. on the material, on diameter, depth of thread, pitch, setting measure, top rake, grinding angle, and last not least on the desired cleanness of the thread flanks. Therefore, the following chart is just a trial to give approximate guidelines. Starting with them it should be possible to try out the cutting speed for each individual case.
The first column of the chart contains a few materials only. Not listed materials should be ranged between such which were listed.
The second column gives speed data for cutting angular threads. For this, please bear in mind that the lower cutting speed refers to the larger diameter while the higher cutting speed should be applied to smaller diameters.
For fine threads the following may serve as a rule of thumb: Look up standard threads and find out that thread which has the same pitch as should have the fine thread you intend to cut, and select the same cutting speed that would be favourable for the normal angular thread.
In the third column "Acme threads" is likewise given a speed range which should be applied in accordance with he work piece diameter (the smaller the diameter, the greater the cutting speed).

Material	Cutting Speeds [m/ min]
Free cutting steels	15 - 40
Structural steels up to 500 N/mm²	10 - 40
Structural steels > 500 N/mm²	5 - 15
High-alloyed steels (stainless)	3 - 8
Tubes	15 - 40
Malleable iron-fittings	10 - 30
Gray cast	10 - 25
MS 58	30 - 60
MS 60-62	30 - 50
Bronze	20 - 50
Copper	15 - 40
Aluminium-alloys	20 - 60

For threads on pipes and fittings there is no large choice of materials. Here the cutting speed is ranging from 10 to 20 m/ min. However, where it is permissible to let the pipe project from the vice by a greater length so that it sings during the cutting operation, it will be possible to reach cutting speeds between 30 and 40 m/ min. Even in dry cutting. However, the flank of the thread is no longer clean. One may say on principle that an improved surface quality will always be bought at the price of a reduced cutting speed.
The proper cutting speed for each case has to be found by trial.

On the usage of page 12 cutting speed chart:

The left-hand scale "D" is graduated on one side in millimetres, and an the other side in inches. Outside diameters, and finally further to the right there are the outside diameters for Whitworth pipe threads. The scale in the middle indicates the speeds (it is recommended to mark the possible speeds of the machine in nomograms), and on the right side is the scale for the cutting speeds to be calculated.
When drawing a straight line from the desired diameter through the desired speed you will hit upon the relative cutting speed. The example outlined shows:

d = 20 mm → n = 64/ min → v = 4 m/ min

2. Calculating the helix angle

Usually it is not necessary to know the helix of a thread because the threads are listed in the holder chart in such a way that the holder corresponding to each thread may be read anyway. However, for special cases that are not listed in the holder chart, you may quickly calculate the pitch angle of the thread by taking recourse to page 16. In doing so, take care that the diameter to be applied to the thread in question should not be the outside diameter but the medium diameter, i.e.:

$$d_2 = \frac{(d + d_3)}{2}$$

d_2 = medium diameter
d = outside diameter
d_3 = core diameter

Helix angle φ is calculated according to the relation:

$$\text{tg}\,\varphi = \frac{P}{(\pi \times d_2)}$$

P = pitch of the thread [mm]
d_2 = medium diameter (or flank diameter respect.)

The left side of the GSL 52 nomogram contains the "P" scale, in the middle is the "d" scale, and on the right side "φ" scale. For the latter the angle on the left side is given in centigrade, while on the right side φ can be read in degrees and minutes.

After all, you look up the pitch of the desired thread on the "P" scale and the medium diameter on the "d2" scale. Connect the two points by a straight line and you will hit upon the relative helix angle on the "φ" scale.
The example outlined in the chart shows the calculation of the helix angle for M 16 thread.
The mean diameter is:

$$d_2 = \frac{(d + d_3)}{2} = (16 + 13.402)/2 = 14.701 \text{ mm}$$

(Pitch diameter likewise 14.701 mm)

Pitch P = 2 mm
Connecting line (P - d_2) gives a helix angle φ of 2.49° or 2° 29'.
In view of the fact that the medium diameter only deviates very slightly from the flank diameter it is permissible in most cases to calculate with the flank diameter.

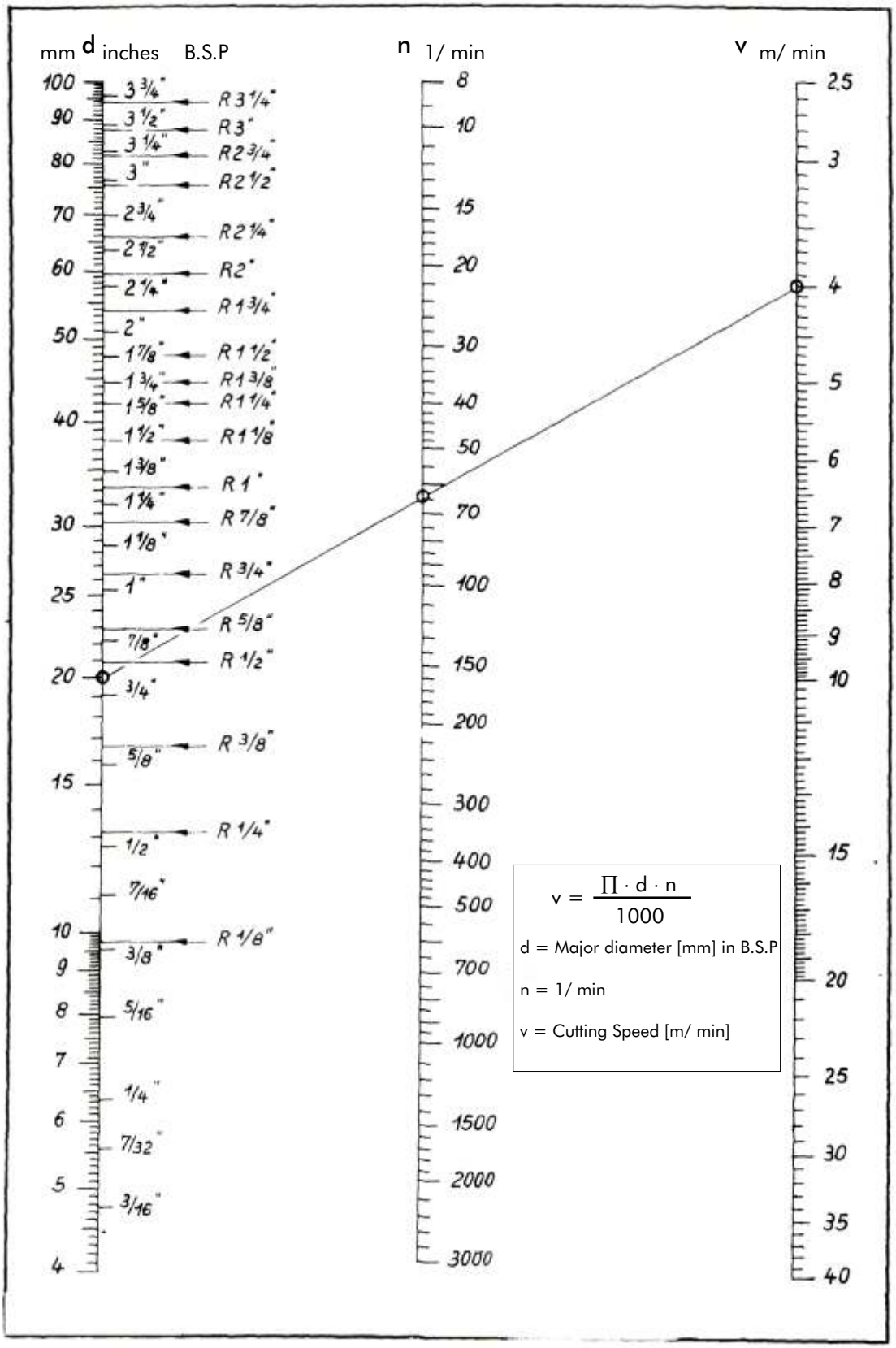
C. Coolant and lubricant

In principle, when thread cutting we work with cooling lubricants. A good supply of cooling lubricants is necessary.
Our recommendation: degree of greasiness: approx. 8 - 12 %. Diluted soluble oil can be used. However, cutting oil can lead to a considerable improvement of the cutting process and of the thread Gut.

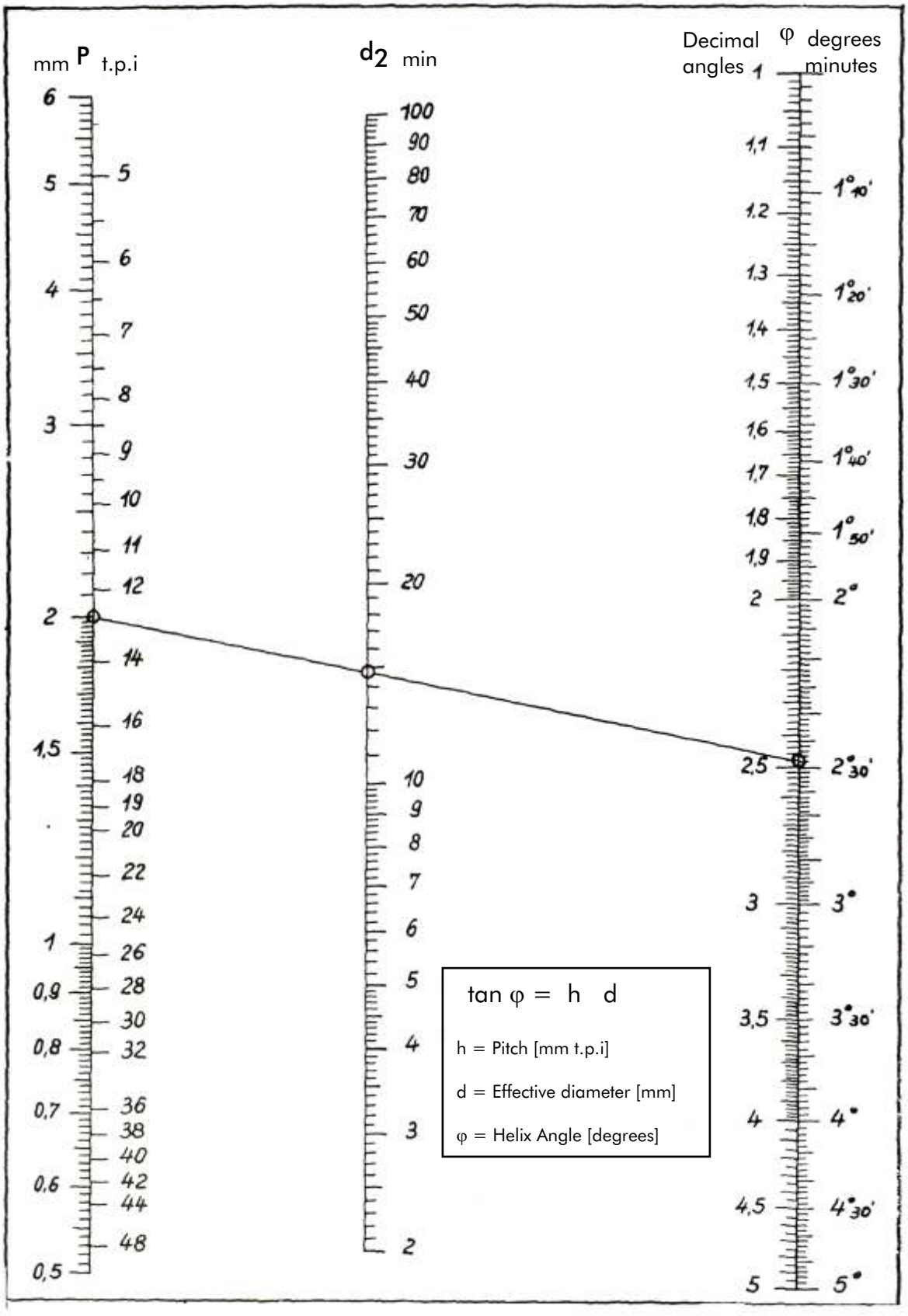
There is the risk that parts could bind, when using synthetic cooling emulsion. In this case, function of the thread cutting head is reduced.

In special cases we recommend to cooperate with the manufacturing company.

D. Nomogram for determination of cutting speed



E. Nomogram for determination of helix angle



5.0 Faulty threads and their causes

Faulty threads can have several causes:

1) The sequence of chasers from 1 to 4 has not been observed. This results in a completely miscut thread. In case the chasers have been set in the reverse sense, i.e. 4, 3, 2, 1 no thread results at all.

2) Chasers with different serial numbers may have been used. Then the accurate offset of the four chasers is no longer guaranteed, thus resulting in faulty threads.

3) Chasers may have been mixed up, e.g. it is impossible to cut a cylindrical thread with a chaser for taper threads.

4) The wrong setting value or grinding angle may have been chosen. This may result in a thin thread, i.e. the included angle is too small and the gap in the root is too wide.

5) Faults mentioned under items 1) to 4) were not made, however, the material to be cut requires different setting values respectively grinding angle- and top rake values. In the following a number of faults are listed in order to avoid faulty threads:

Fault	Cause
1. The thread is not concentric	• The four chasers were not adjusted exactly to the same setting value • The setting value was too small • The material was not concentric or sheared off bevelled and the cutting Speed was too low • The top rake was too large • Length "f" of guide teeth in front of the working face was too short • Alignment of work piece and thread cutting head is not accurate enough.
2. Faulty lead	• The lead angle of the chaser holder is incorrect. To be compared with thread- and holder tables, whether the correct holder was chosen for the thread to be cut. • The grinding angle is incorrect. • The setting value is incorrect. • The slide of the machine offers too much resistance or the feed rate is not correct. • The feed pressure is not correct in relation to the lead.
3. Wrong included angel	• Chaser was Set in the holder tilted • Churping plate and position of chaser to be checked
4. Thread depth is too small	• The grinding angle is too small or even negative • The setting value is too small

5. Threads are of poor quality, flank surfaces are rough	• These faults can be due to the formation of a built-up edge which is often caused by selecting the top rake too low. • Chaser is blunt • Cutting speed is too high • Coolant resp. lubricant chosen is unsuitable
6. Continuous flutes alongside of the thread flanks	• Offset fault to be checked • Do bear chasers and holders have the same serial number? • Guide tooth does not begin exactly with tooth space. The side of the first tooth of the guide tooth must not be ground. • Chaser broken or blunt
7. Chatter marks on the thread	• Setting value is too small • Cutting speed is too high • Too long clamped in the clamping vice • Top rake was too small for soft material
8. Thread is eccentric to shank	• Work piece is clamped eccentrically • The work piece centre is not centrical to the centre of the thread cutting head.
9. A multi-start thread is obtained	• The chasers were not mounted in the correct sequence • Heavy feed pressure may result in the production of multi-start threads • when cutting fine threads of a comparatively large diameter, the chasers will then continue automatically to cut these multi-start threads
10. Chasers break out	• Too much oversize • The material is not concentric or sheared off • The setting value chosen is too small • The cutting speed is too low

6.0 Instructions for the use of the setting table

To ensure that the chasers are uniformly set in the correct relationship to the work piece, they are adjusted in a setting jig equipped with a dial indicator. An accuracy of a few hundredths of a millimetre may be considered adequate. The desired values can be obtained from the setting table to an accuracy of 0.05 mm. The top row lists a large variety of customary threads. Since the setting value depends an the core diameter (minor thread diameter), this is listed in the first column. The second column gives the setting length. This is value C + δ from fig. 3 on page 29, plus the setting value from the third column of the setting table (under the condition that the chaser is placed exactly at the centre of the work piece as shown in fig. 6.)

To determine the setting value of a thread not listed in these tables, it is merely necessary to know the core diameter. This core diameter should be interpolated in the appropriate position in the first column, the setting length and the setting value will then be found in adjacent positions in the second and third columns respectively.

The values thus obtained provide a setting in which the cutting edge of the chaser is accurately positioned along, the centreline of the work piece. However, this setting, does not always result in the production of good threads.

It will often be necessary to select a larger setting value (see fig. 8).

Especially when cutting soft material it is necessary to place the cutting edge beyond the centre line of the work piece, i.e. to increase the setting value if, for example, no normal threads are obtained or the flanks are very unclean when cutting with the normal setting value. It is recommended to try whether an increase of the setting value by 1 % of the diameter has already good cutting results. If not, the chaser has to be adjusted further. Depending on the type of thread, the setting value had to be increased occasionally up to 3 % of the diameter. But it must be remembered that the cutting temperature is always increased if the chaser is threading beyond the centre line of the work piece, as in this setting the chaser presses in the flanks. The setting value should therefore not be increased more than absolutely necessary to produce the desired clean threads

7.0 Instructions for using the table of chaser holders

The table of chaser holders enables the user to select the suitable holder in accordance to his requirements. This avoids time-consuming enquiries.

The head of the table contains a large number of standard threads which include not only German threads but also English and American types. American pipe threads appear under the description NPT.

The first column lists all normal chaser holders which can be supplied for any particular thread-cutting head.

The second column lists the holder angle, following a column giving the dimensions of the chaser. In this last column the first two figures refer to the cross-section of the chaser and the last figure to the length of a new chaser. Re-grinding will, of course, reduce this length. The minimum and maximum core diameters which can be cut with any given holder is listed in the fifth column.

8.0 Attachments

A. Setting table for thread cutting heads WHK-S3: Holder: WH 21B, 22B

Kern-Ø des Gewindes	Einstelllänge	Einstellwert Lehre 14Ø	Einstellwert Lehre:	Einstellwert Lehre:		Whitworth-Rohrgewinde DIN 2999 ISO 7/1	Amerikanische Rohrgewinde			
								NPT, API *		
8,75										
10,00	110,70	0,70								
11,36	110,75	0,75								
12,85	110,80	0,80								
14,51	110,85	0,85								
16,44	110,90	0,90				R 3/8		3/8 - 18		
18,80	110,95	0,95				R ½"				
22,23	111,00	1,00						½" - 14		
31,77	111,05	1,05				R ¾ · R1		¾" - 14 · 1" - 11½		
35,20	111,00	1,00								
37,56	110,95	0,95								
39,49	110,90	0,90				R 1 ¼"		1 ¼" - 11 ½"		
41,15	110,85	0,85								
42,64	110,80	0,80								
44,00	110,75	0,75								
45,25	110,70	0,70				R 1 ½"		1 ½" - 11 ½		
46,43	110,65	0,65								
47,53	110,60	0,60								
48,58	110,55	0,55								
49,58	110,50	0,50								

A. Setting table for thread cutting heads WHK-S3: Holder: WH 23B

Kern-Ø des Gewindes	Einstelllänge	Einstellwert Lehre 14Ø	Einstellwert Lehre:	Einstellwert Lehre:		Whitworth-Rohrgewinde DIN 2999 ISO 7/1	Amerikanische Rohrgewinde			
								NPT, API *		
45,50										
46,96	111,05	1,05								
48,30	111,00	1,00								
49,54	110,95	0,95								
50,70	110,90	0,90								
51,79	110,85	0,85								
52,83	110,80	0,80								
53,82	110,75	0,75								
54,77	110,70	0,70								
55,69	110,65	0,65								
56,57	110,60	0,60								
57,42	110,55	0,55				R 2"		2" - 11½		
58,24	110,50	0,50								
59,04	110,45	0,45								
59,82	110,40	0,40								
60,57	110,35	0,35								
61,31	110,30	0,30								
62,03	110,25	0,25								
62,73	110,20	0,20								
63,42	110,15	0,15				R 2¼"				
64,09	110,10	0,10								
64,75	110,05	0,05								
65,39	110,00	0,00								
66,03	109,95									
66,65	109,90									
67,26	109,85									
67,86	109,80									
68,45	109,75									

A. Setting table for thread cutting heads WHK-S3: Holder: WH 24B

Kern-Ø des Gewindes	Einstelllänge	Einstellwert Lehre 14Ø	Einstellwert Lehre:	Einstellwert Lehre:		Whitworth-Rohrgewinde DIN 2999 ISO 7/1	Amerikanische Rohrgewinde		
								NPT, API *	
54,66									
67,34	114,35	4,35							
70,27	114,30	4,30						2½" -8	
72,47	114,25	4,25				R 2 ½"			
74,31	114,20	4,20							
75,93	114,15	4,15							
77,39	114,10	4,10							
78,73	114,05	4,05							
79,97	114,00	4,00							
81,13	113,95	3,95							
82,23	113,90	3,90							
83,28	113,85	3,85							
84,28	113,80	3,80							
85,24	113,75	3,75				R 3"		3" - 8	
86,16	113,70	3,70							
87,05	113,65	3,65							
87,90	113,60	3,60							
88,74	113,55	3,55							

A. Setting table for thread cutting heads WHK-S3: Holder: WH 25B

Kern-Ø des Gewindes	Einstelllänge	Einstellwert Lehre 14Ø	Einstellwert Lehre:	Einstellwert Lehre:	Whitworth-Rohrgewinde DIN 2999 ISO 7/1	Amerikanische Rohrgewinde NPT, API *			
88,35									
89,02	112,35	2,35							
89,67	112,30	2,30							
90,32	112,25	2,25							
90,95	112,20	2,20							
91,56	112,15	2,15							
92,17	112,10	2,10							
92,77	112,05	2,05							
93,36	112,00	2,00							
93,94	111,95	1,95							
94,51	111,90	1,90							
95,07	111,85	1,85							
95,62	111,80	1,80							
96,17	111,75	1,75							
96,71	111,70	1,70							
97,24	111,65	1,65							
97,77	111,60	1,60			R 3½"				
98,29	111,55	1,55							
98,80	111,50	1,50							
99,30	111,45	1,45							
99,80	111,40	1,40							
100,30	111,35	1,35							
100,79	111,30	1,30							
101,27	111,25	1,25							
101,75	111,20	1,20							
102,22	111,15	1,15							
102,69	111,10	1,10							
103,15	111,05	1,05							
103,61	111,00	1,00							
104,07	110,95	0,95							
104,52	110,90	0,90							
104,96	110,85	0,85							
105,40	110,80	0,80							
105,84	110,75	0,75							
106,28	110,70	0,70							
106,71	110,65	0,65							
107,13	110,60	0,60							
107,55	110,55	0,55							
107,97	110,50	0,50							
108,39	110,45	0,45							
108,80	110,40	0,40							
109,21	110,35	0,35							
109,61	110,30	0,30							
110,02	110,25	0,25				4" - 8			
110,42	110,20	0,20			R 4"				
110,81	110,15	0,15							
111,20	110,10	0,10							
111,59	110,05	0,05							
111,98	110,00	0,00							

B. Holder Table for thread cutting head WHK-S3

Chaser holder			Cutting range Core diameter in mm	Metric fine threads DIN 246, 247, 516- 519	Whitworth-pipe threads DIN 259/ 2999	American National Threads		Conduit threads	Steel conduit pipe threads DIN 40430
Designation Product-No.	Holder angle in °	Dimension of chasers				NF UNF	NPT		
WH21B 740800	1.50°	25x12x100	10 - 30	M 18.19.20.21.22 x 1.5 M 23.24.25.26.27.28 x 2	3/8" ½" 5/8" ¾" 7/8"	¾ - 16 7/8 - 14 1 - 12 (1 - 14) (1 1/8" - 12)	½ - 14 3/4 - 14	W 5/8" x 1/18" W3/4" x 1/16" W1" x 1/16" W1 ¼" x 1/16	Pg 9 Pg 11 Pg 13,5 Pg 16 Pg 21
WH22B 740801	1.08°	25x12x100	28 - 48	M 32.33.34.35.36 x 2 M 40.42.45.48.50 x 3	1" 1 1/8" 1 ¼" 1 3/8" 1 ½"	(1 ¼" - 12) (1 3/8" - 12) 1 ½" - 12	(1 - 11 ½) 1 ¼ - 11 ½ 1 ½ - 11 ½	W 1 ½" x 1/14	Pg 29 Pg 36
WH23B 740802	0.92°	25x12x100	47 - 67	M 55.56.58.60 x 3 M 62.64.65.68 x 3	1 5/8" 1 ¾" 2" 2 ¼"		2 - 11½	W 2" x 1/14" W 2 ½" x 1/14	Pg 42 Pg 48
WH24B 740803	0.75°	25x12x100	66 - 87	M 70.72.75.76.78.80 x 2 M 72.75.76.78.808.82.85.88 x 3	2 3/8" 2 ½" 2 ¾" 3"		2 ½ - 8 3 - 8		
WH25B 740804	0.67°	25x12x100	90 - 110	M 95-110 x 1.5 M 95-110 x 2	3 ¼" 3 ½" 3 ¾" 4"		3 ½ - 8 4 - 8		

C. List of spare parts

WAGNER thread cutting head WHK-S3 with special locking collar
Part-no. 74440300

pos.	piece	part-no.	description
1	1	70989000	excentric ring
2	1	70909000	pointer
3	1	02020004	screw M3x8
4	1	70995400	excentric casing
5	1	70990800	adjusting pinion
6	1	02882001	ball grease nipple
7	3	70990400	clamping screw
8	3	03021003	clamping nut
9	4	02015218	internal hexagonal screw M10X70 DIN912
10	1	70817400	guide ring
11	1	70834800	square nut
12	1	70834900	square nut (counter nut)
13	1	02048208	handless screw M8X25 DIN915
14	1	02882003	ball grease nipple
15	1	03011701	internal hexagonal screw M10X15
16	1	70817300	die stock head, group complete
17	4	70808800	pressure bushing
18	4	03310356	pressure spring 2,5 X 13,5 X 60,0
19	4	02030157	shank screw M 6X12 DIN 427
20	1	70997000	sliding key
21	2	02020209	countersunk machine srew M 8 X 20 DIN 63
22	1	02160071	adjusting spring
23	4	02040362	studs M 16 X 50 DIN 939
24	8	02061009	nuts M16 DIN 934
25	1	70991000	flange
26	4	70808700	bushing for holder bolts
27	4	70808600	holder bolts
28	4	02016260	internal hexagonal screw M12X40 DIN6912
29	4	70995100	holder guides
30	8	02121310	cylindrical pins 6 X 24 DIN 1474
31	4	02016257	internal hexagonal screw M 12X 25
32	1	77944700	cover ring
33	4	02043256	handless screw M 12X12 DIN 551
34	8	02043206	handless screw M 10X12 DIN 551
35	1	77941800	threaded bushing
36	1	77942300	pressure screw
37	1	78002800	bolt for spring
38	5	02320111	cup spring
39	1	02112156	cylindrical pin M6 X 8 DIN 7
40	1	78054500	ball bearing
41	1	77944300	internal ring of ball
42	1	74436800	external ring of ball
43	1	77944400	ring of ball
44	1	77944600	cage of ball
45	60	02460135	ball
46	12	02015110	internal hexagonal screw M6X30 DIN912
47	1	02882001	ball grease nipple DIN71412

C. List of spare parts (cont.)

WAGNER thread cutting head WHK-S3 with special locking collar
Part-no. 74440300

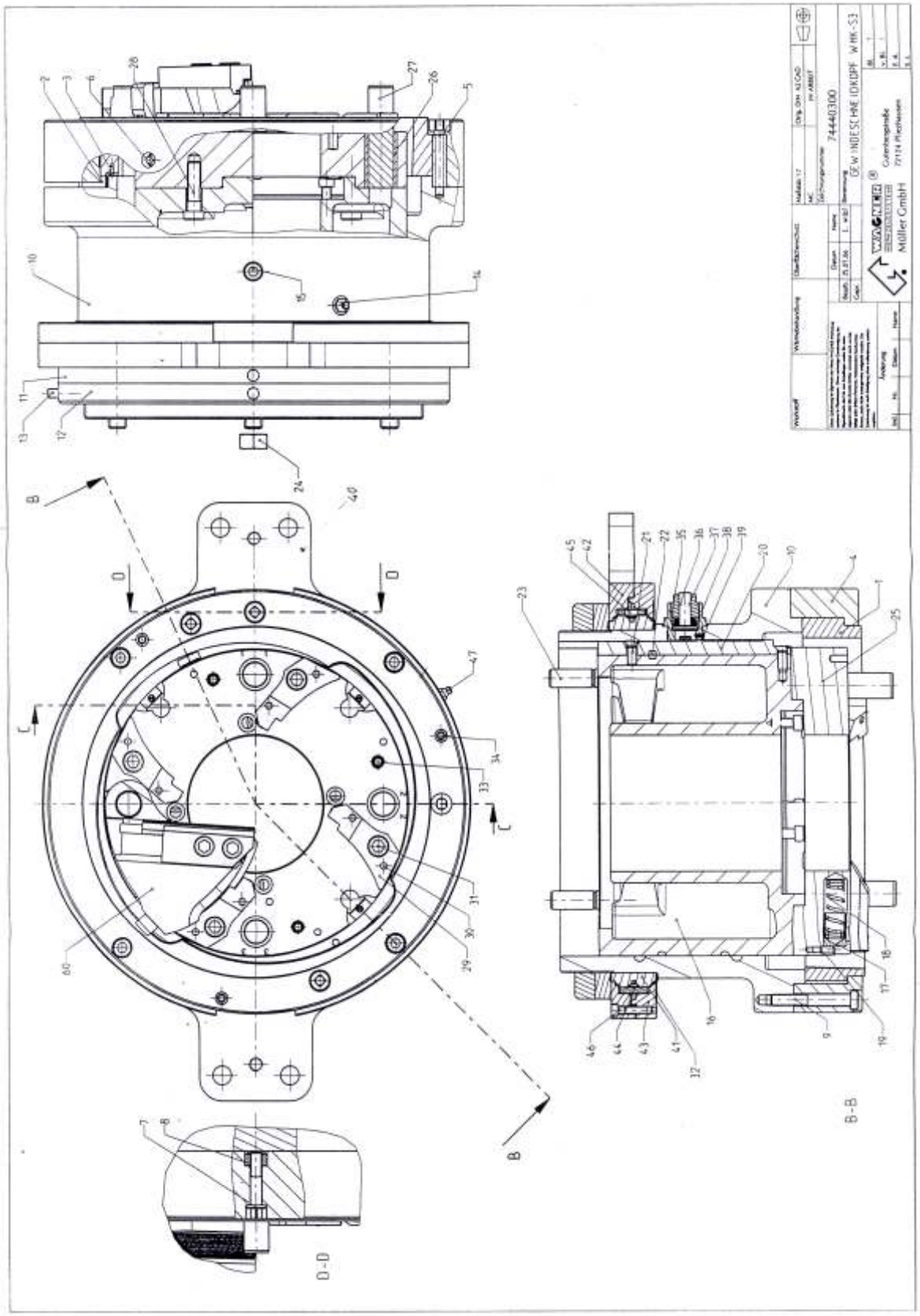
pos.	piece	part-no.	description
			accessories head
50	1	03889003	pressure lubricator
51	1	70997100	clamping ring
52	1	02675005	hexagonal secket head wrench
53	1	03697006	hexagonal secket head wrench 8 DIN 6911
54	1	03697007	hexagonal secket head wrench 10 DIN 6911
55	3	02048265	handless screw M10X55 DIN915
80	1	02033002	mounting ring screw M10 DIN 580
81	1	73949200	
82	1	02015259	internal hexagonal screw M 12X 25 DIN912
83	1	02015221	internal hexagonal screw M 10X 90 DIN912
60	4		chaser holders
61	4	02016054	internal hexagonal screw M 5X 16 DIN 6912
62	4	*	sliding pad
63	4	*	plate
64	8	02015209	internal hexagonal screw M 10X 25 DIN 912
65	4	70511700	adjusting screw
66	4	70511800	stop
67	4	02121360	grooves pin 8x24
68	1	02677005	hexagonal secket head wrench 5 DIN 911
69	1	02677007	hexagonal secket head wrench 8 DIN 911
71	4	70807800	shim 16X8X20
72	4	73165700	shim 16X8X45
70	4		chasers

* please give us the holder type

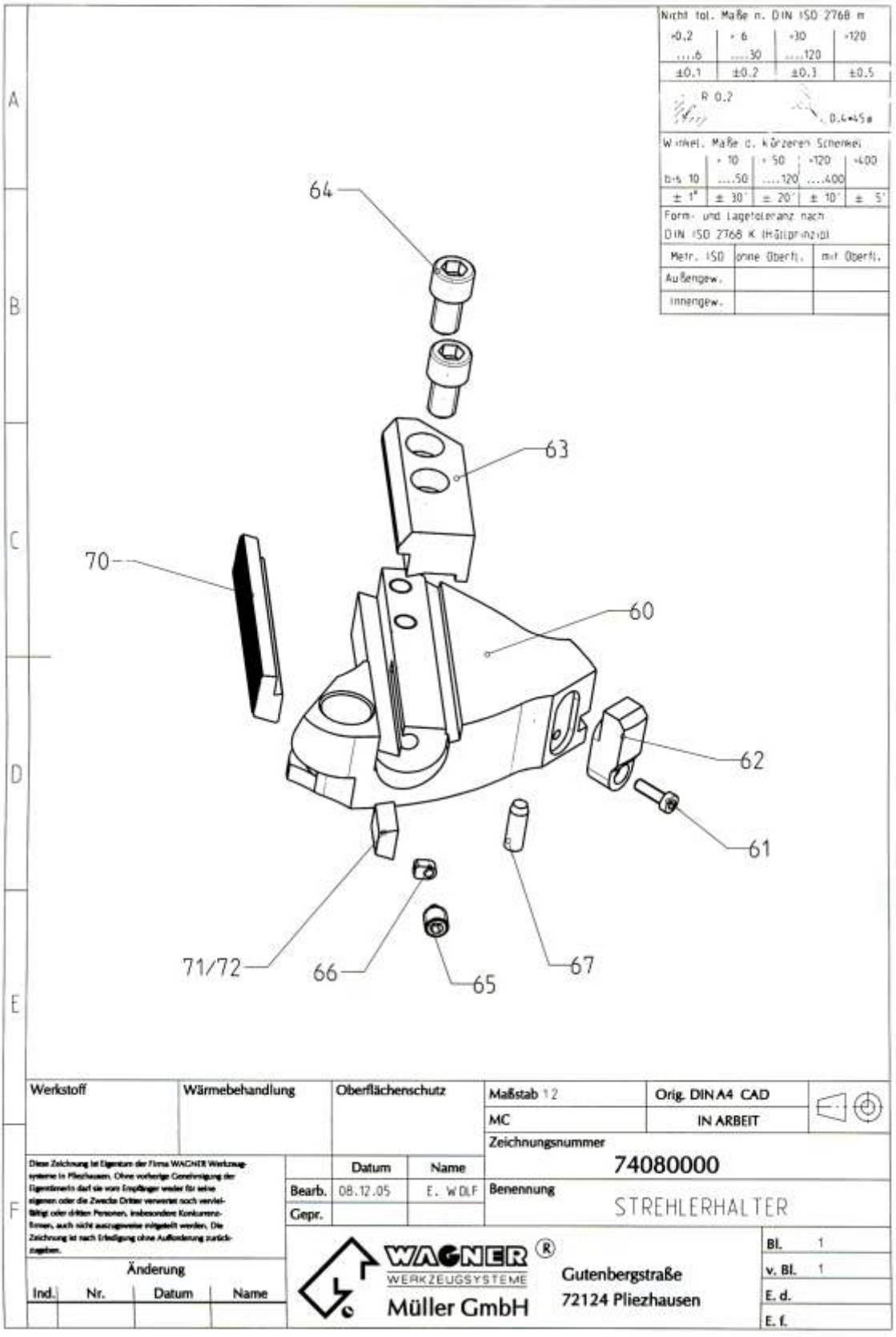
Adjusting device
Part.-no. 77063900

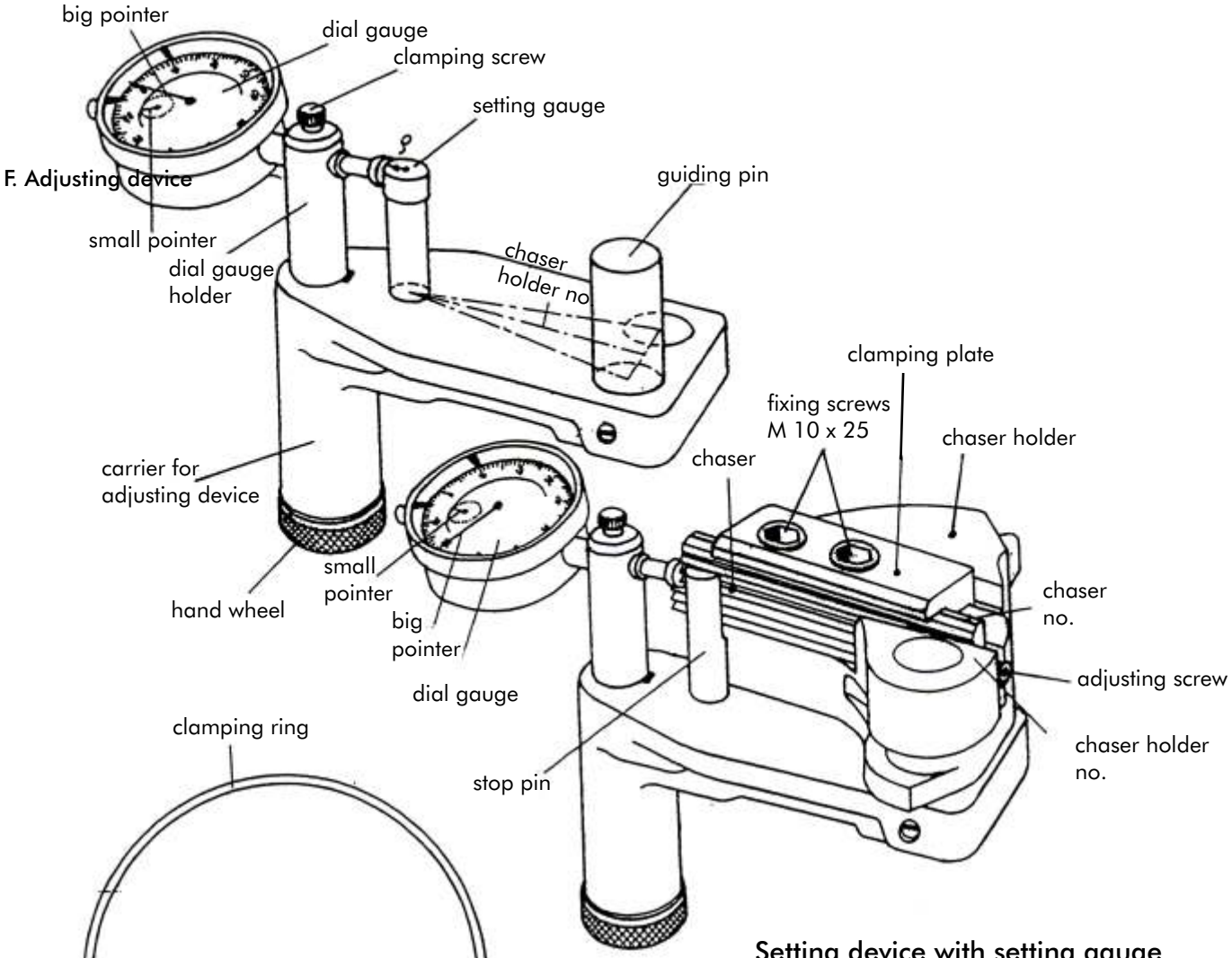
10 (E1)	1	77924500	carrier for adjusting device WGK-WHK
20	2	02044204	grub screw DIN553 M 8x8
30 (E2)	1	77925600	guiding pin WGK-WHKK
40 (E7)	1	77924700	dial gauge holder WDK-WKK
50	1	02160041	feather key DIN6885-FORM A / 5x5x25
60 (E4)	1	70259000	knurled head screw ZR16+22 M5 RD 8x11
70	1	77924800	screw WJK-WKKK M 10x65
80	1	77924900	washer WJK-WKKK RD 34/8,2x3
90	2	02020055	countersink screw M 4x10 DIN63
100 (E8)	1	77925000	thumb wheel WJK-WKKK RD 34/8x8
110	1	02116266	split pin 4x32 DIN 1481
120 (E3)	1	77925100	stop pin WDK-WKKK
130 (E5)	1	77925700	setting gauge WDK-WEKK RD 14x65 DIN
140	1	06525022	caliper for dial gauge M2,5
(E6)	1	06525003	dial gauge

D. Drawing of WHK-S3 (744 403 00)

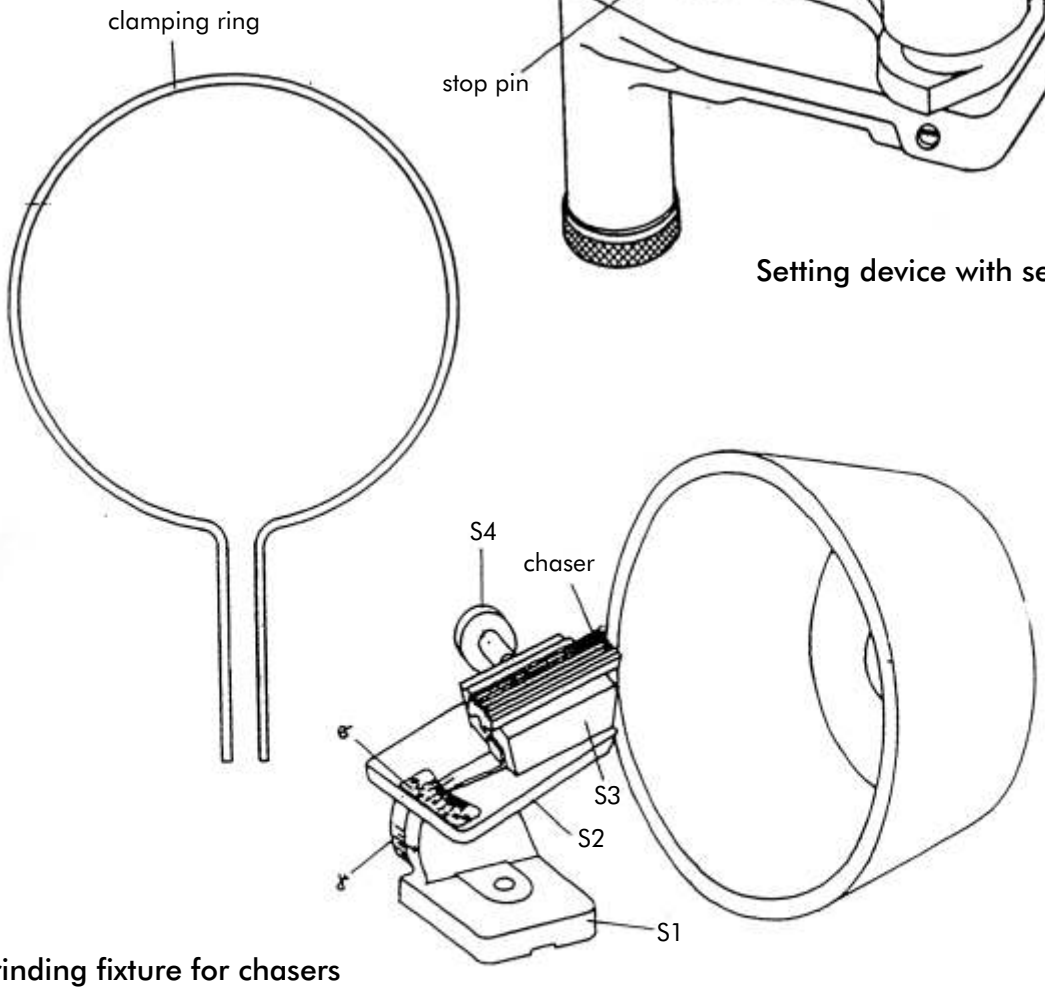


E. Drawing of chaser holder (740 800 00)





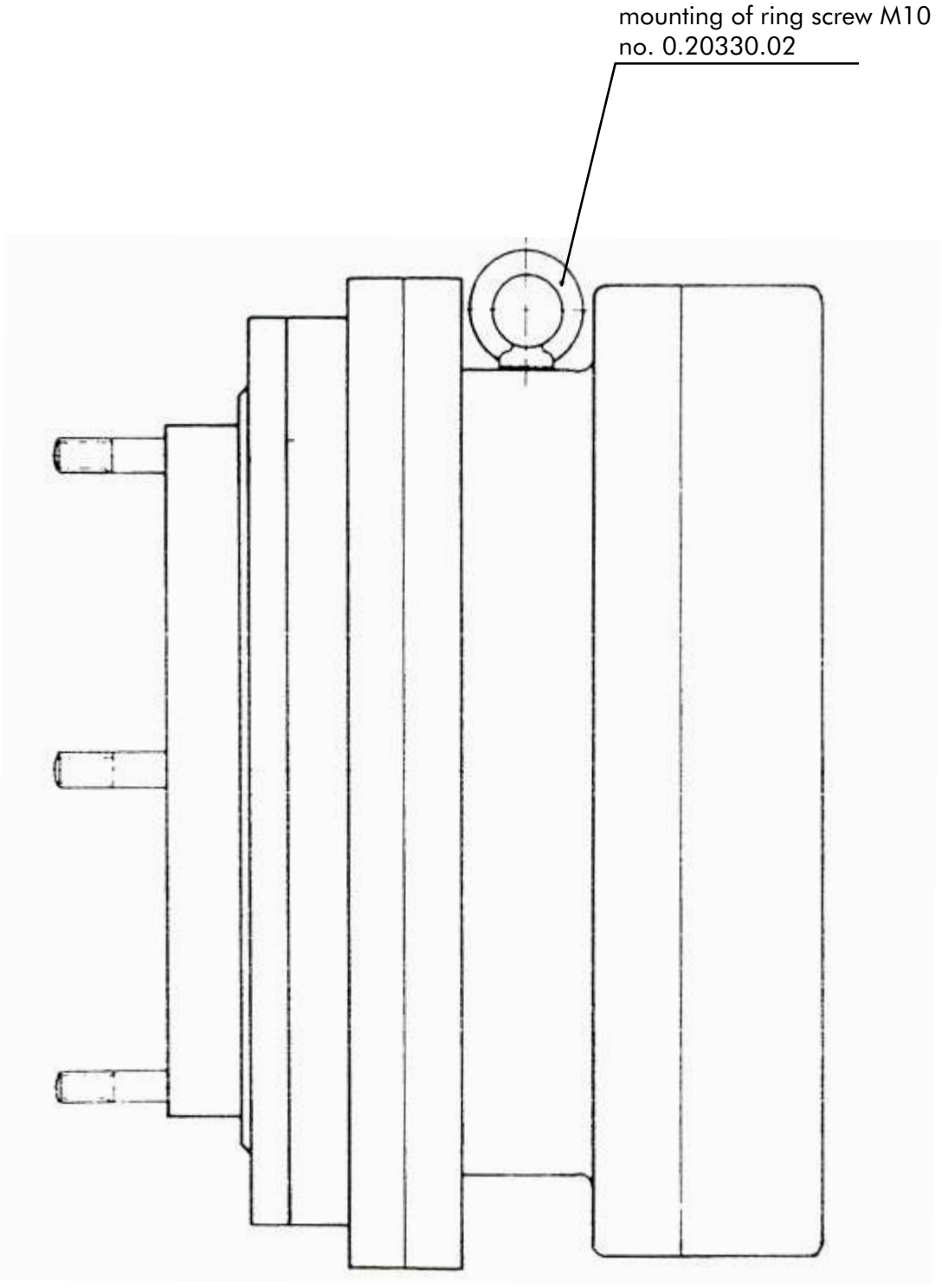
Setting device with setting gauge



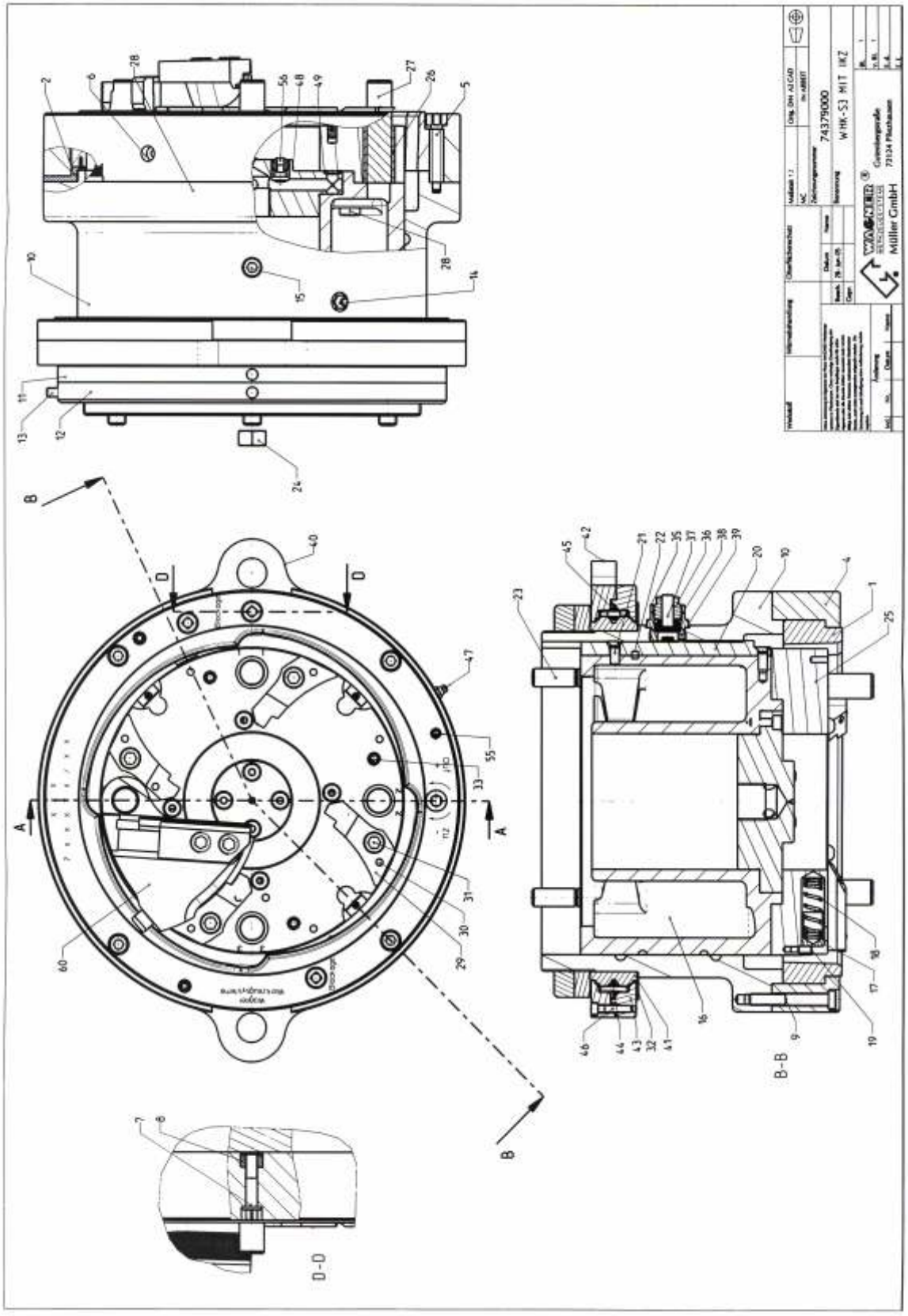
Grinding fixture for chasers

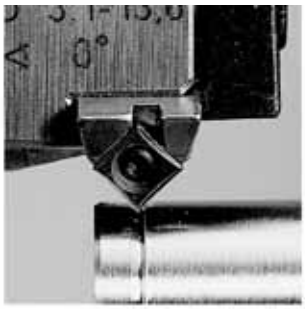
G. Hanging up instruction

For mounting the die head the screw no. 61 has to be removed so that the ring screw 0.20330.02 can be inserted.



H. Application of die head WHK-S3



WAGNER®
WERKZEUGSYSTEME
MÜLLER GMBH

Gutenbergstraße 4/1
D-72124 Pliezhausen

Telefon (07127) 97 33 00
Telefax (07127) 97 33 90

Email: info@wagner-werkzeug.de
www.wagner-werkzeug.de